GENERALIZED LINEAR MODEL APPROACH FOR MODELING RAINFALL OCCURRENCE

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"I declare that this thesis entitled "*Generalized Linear Model Approach for Modeling Rainfall Occurrence*" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : …….

Supervisor : HII SHIUN LEH

Date :

To my dearest family members.

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ABSTRACT

Rainfall modeling has been used to identify the characteristics of the rainfall occurrence and rainfall amount. The daily rainfall data was obtained from the Malaysian Drainage and Irrigation Department for six selected rain gauge stations over period of 32 years ranging from 1980 to 2011 in Peninsular Malaysia. The purpose of this study is to model the rainfall occurrence that varies as a function of time of year using Generalized Linear Model (GLM) and compare rainfall patterns between stations or regions based on the smoothing curves. The rainfall occurrence was fitted with a two-state first order Markov chain model in this study. The transition probabilities for first order Markov chain model were calculated using the maximum likelihood method. Since the transition probabilities for all stations are not stationary, smoothing curves to model the transition probabilities using Fourier series throughout the year were suggested. Analysis of deviance table was obtained by using statistical program *R* project. The result shows that all the stations display a bimodal pattern of rainfall with two distinct peaks except station Hospital Pontian for transition probabilities of dry day to rainy day and station Ipoh for transition probabilities of rainy day to rainy day. Based on the observations, rainfall modeling can be applied in agriculture sector.

ABSTRAK

Pemodelan hujan telah digunakan untuk mengenal pasti ciri-ciri kejadian hujan dan jumlah hujan. Data hujan harian telah diperolehi daripada Jabatan Pengairan dan Saliran Malaysia untuk enam tolok hujan yang terpilih dalam tempoh 32 tahun dari tahun 1980 hingga 2011 di Semenanjung Malaysia. Tujuan kajian ini adalah untuk memodelkan kejadian hujan menggunakan *Generalized Linear Model* (GLM) dan membandingkan corak hujan antara stesen atau wilayah berdasarkan lengkung licin. Model raintaian Markov peringkat pertama dengan dua keadaan telah digunakan untuk memodelkan kejadian hujan dalam kajian ini. Kebarangkalian peralihan untuk model raintaian Markov peringkat pertama telah dikira menggunakan kaedah maksimum kebolehjadian. Kebarangkalian peralihan untuk semua stesen tidak pegun, jadi lengkung licin untuk memodelkan kebarangkalian peralihan menggunakan siri *Fourier* sepanjang tahun telah dicadangkan. Jadual untuk analisis deviance telah diperolehi dengan menggunakan program statistik *R* projek. Hasilnya menunjukkan bahawa semua stesen memaparkan corak bimodal hujan dengan dua puncak yang berbeza kecuali stesen Hospital Pontian bagi kebarangkalian peralihan dari hari kering kepada hari hujan dan stesen Ipoh bagi kebarangkalian peralihan dari hari hujan kepada hari hujan. Berdasarkan pemerhatian, pemodelan hujan boleh digunakan dalam sektor pertanian.